REMARKS/ARGUMENTS

The claims are 11-18. Claims 16 and 18 have been amended to specify that the d.c. voltage source is formed by a solar module. Support for the claims may be found, *inter alia*, in the disclosure at page 7. Reconsideration is expressly requested.

Claims 12-18 were rejected under 35 U.S.C. 103(a) as being unpatentable over *Nakata et al. U.S. Patent No. 5,719,758* in view of *Midya et al. U.S. Patent No. 5,801,519*. The remaining claim 11 was rejected under 35 U.S.C. 103(a) as being unpatentable over *Nakata et al*. and *Midya et al*., and further in view of *Yang U.S. Patent No. 6,597,159*. Essentially the Examiner's position was that *Nakata et al*. discloses the method and apparatus recited in the claims, except for features which were considered disclosed by the secondary references to *Midya et al*. and *Yang*.

This rejection is respectfully traversed.

As set forth in claim 16 as amended, Applicants' invention provides a solar inverter for feeding current produced by a d.c. voltage source into an a.c. voltage grid. The d.c. source is formed by a solar module and the inverter includes a bridge inverter, a transformer, a rectifier, a buck chopper including a full bridge and an output filter, with a control device being provided for controlling the parameters of the inverter. A device for detecting the current produced by the d.c. voltage source is connected to the control device.

As recited in claim 16 as amended, the bridge inverter is designed for adapting a dead time for the switching elements and/or a pulse duration, or frequency, respectively, for the pulse width modulation as a function of the current detected. The dead time represents a time of the switching elements for

switching over from one switching element to a further switching element connected in series of the bridge inverter, thereby ensuring that parasitic capacities stored in the switching elements of the bridge inverter can be completely recharged and no excessively long switching pauses can occur at the same time.

As set forth in claim 18 as amended, Applicants' invention provides a method for a solar inverter for feeding current produced by a d.c. voltage source formed by a solar module into an a.c. voltage grid. In accordance with the method recited in claim 18 as amended, the current produced by the d.c. voltage source is chopped in a form of a pulse width modulation by a bridge inverter by alternate switching of switching elements connected in parallel and connected in series. The current chopped is transmitted via a transformer connected between the switching elements that are connected in series. The current transmitted is rectified and fed into the a.c. voltage grid via a

buck chopper. For power adaptation, the switching times of the switching elements of the bridge inverter are controlled, or regulated, respectively.

As recited in claim 18 as amended, the current produced by the d.c. voltage source is detected at intervals which are cyclical or is detected permanently, and a dead time of the switching elements of the bridge inverter is set as a function of the detected current of the d.c. voltage source. The dead time represents a time of the switching elements for switching over from one switching element to a further switching element connected in series of the bridge inverter, thereby ensuring that parasitic capacities stored in the switching elements of the bridge inverter can be completely recharged and no excessively long switching pauses can occur at the same time.

The primary reference to *Nakata et al.* describes an inverter control method and an inverter apparatus using that method. *Nakata et al.* uses a pulse width modulation (PWM) control to achieve a maximum output power for each d.c. power supply. In one embodiment of *Nakata et al.*, the pulse width of the pulse train signal is monitored and when a variation of the pulse width substantially disappears within a specified time it is decided that the operating point on the output characteristic curve of the d.c. power supply is located on the open-circuit voltage side of the maximum power point. On the other hand, when the variation of the pulse width does not disappear after an elapse of the specified time, it is determined that the operating point is located on the short-circuit current side of the maximum power point. Then, based on the determination, the on/off operation of the switching element is performed through pulse width modulation (PWM) control. See column 5, lines 56 to 67 of *Nakata et al.*

The arrangement according to *Nakata et al.* obviates the provision of the circuit for detecting the external data of the d.c. input current, d.c. input voltage and the like, a photovoltaic array power calculating section and photovoltaic array power comparing section, which simplifies the circuit construction and allows the cost to be suppressed low (see column 6, lines 22 to 27 of *Nakata et al.*).

According to *Nakata et al.* it is not required to obtain d.c. power in contrast to the prior art. See column 7, lines 26 to 30 of *Nakata et al.*

Contrary to *Nakata et al.*, Applicants' invention as recited in claims 16 and 18 as amended relates to a method for an inverter with which the degree of effectiveness can be substantially increased in a simple form. According to Applicants' inverter and method, the energy produced by the d.c.

voltage source is detected in particular at cyclical intervals or permanently, and that time of the switching elements of the bridge inverter is set as a function of the detected current of the d.c. voltage source. Thus, it is possible to adapt the inverter to the input power delivered simply. By adapting the switching times of the switching elements it is ensured that the parasitic capacities stored in the switching elements of the bridge inverter can be completely recharged and no excessively long switching pauses can occur at the same time. By changing the frequency of the switching times, it is achieved that the switching losses will be reduced proportionally, and thus, the degree of effectiveness of the circuit will be substantially improved.

Contrary to Applicants' inverter as recited in claims 16 and 18 as amended, *Nakata et al.* does not detect the current produced by the d.c. voltage source, but rather detects the pulse width of

the pulse train. Further, *Nakata et al.* does not set a dead time of the switching elements of the bridge inverter as a function of the detected current of the d.c. voltage source.

The defects and deficiencies of the primary reference to *Nakata et al.* are nowhere remedied by the secondary references to *Midya et al.* and *Yang*. *Midya et al.* describes a self-excited power minimizer/maximizer for switching power converters and switching motor drive applications. A preferred embodiment of *Midya et al.* is used to control a power converter in a solar array application.

Midya et al. describes an alternative embodiment power converter controller where the dead time is controlled for minimum power. See column 11, line 53 to column 12, line 15 of *Midya et al*. The term "dead time" is mentioned in *Midya et al.* only in connection with a power conversion circuit shown in FIG.

15. This circuit of FIG. 15 contains two switches V_g1 and V_g2 with a timing adjustment 122 monitoring the difference between the switch gate command signals and correlating this difference with a representation of the input current. A simple integration control loop changes the dead time (that is the time gap between the two switch commands) until the input current is a minimum. Because the input voltage is fixed, the power consumption will be minimized. As major applications for such a control circuit, inverters for motor drives, backup power, etc. synchronous converters used for low-voltage d.c.-d.c. conversions and resonant conversions in which timing is adjusted to minimize power loss because of switching are mentioned.

Contrary to *Midya et al.*, Applicants' invention as recited in claims 16 and 18 as amended is directed to a method for a solar inverter and a solar inverter including a bridge inverter for chopping the current produced by the d.c. voltage source by

alternate switching of switching elements connected in parallel and connected in series. The dead time according to Applicants' claims represents the time of the switching elements for switching over from one switching element to a further switching element connected in series of the bridge inverter. By setting the dead time of the switching elements of the bridge inverter as a function of the detected current of the d.c. voltage source, it can be ensured that parasitic capacities stored in the switching elements of the bridge inverter can be completely recharged and no excessively long switching poses can occur at the same time.

Accordingly, it is respectfully submitted that the circuit including a bridge inverter and the definition of dead time according to Applicants' claims differs from the circuit and the definition of dead time according to *Midya et al.* Therefore, the combination of *Nakata et al.* and *Midya et al.* cannot render Applicants' claims obvious.

The remaining reference to *Yang* cited with respect to claim 11 has been considered but is believed to be no more pertinent. As discussed in Applicants' Amendment filed January 2, 2009, there is no disclosure or suggestion in *Yang* of controlling the value of the dead time as a function of the detected current of the d.c. voltage source as recited in Applicants' claims 16 and 18 as amended.

To further distinguish Applicants' solar inverter and method from the cited references, Applicants have amended these claims to specify that the d.c. voltage source is formed from a solar module.

In summary, claims 16 and 18 have been amended. In view of the foregoing, it is respectfully requested that the claims be allowed and that this case be passed to issue.

Respectfully submitted,
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